A FLORISTIC AND ECOLOGICAL STUDY OF PITCHER PLANT BOGS IN SOUTH MISSISSIPPI

L. N. ELEUTERIUS and S. B. JONES, JR.

An interest in the effects of fire on the vascular flora of pitcher plant bogs led to a floristic and ecological study of such bogs in south Mississippi. This included the intensive comparison of a peaty bog, which had been burned annually in the winter for the past seven years, with a similar bog which had not been burned for three years. The study area is located in Harrison County, Mississippi, northwest of Gulfport and approximately six miles from the Gulf Coast, and on the southern edge of the Southern Pine Hills. The bogs occupy a position between the hilltop pine forest and the bottomland forest along Bayou Bernard. The two bogs that were studied are both open with a few scattered pine and cypress trees. The soil is an acid, Portmouth, sandy loam with a high organic matter content. The bogs in this area appear to have been only slightly disturbed by the activities of European man.

The ecological aspects of this study are reported in detail in Eleuterius (1968); however, some of our conclusions, observations, and hypotheses are briefly summarized in this paper. We do not suggest that our observations have not been previously noted, but we feel that they should be mentioned here. Pitcher plant bogs have been discussed in a number of papers including Garren (1943), Harper (1906), Plummer (1963 and 1966), and Wells (1928). Since the earlier report by Harper (1906), there have been changes in the vascular flora of pitcher plant habitats in Georgia due to the disturbance of these ecosystems. These changes were described by Pullen and Plummer (1964). We believe that *Sarracenia alata* is dependent upon fire to maintain the open bog, as are a number of our native bog orchids. In the burned bog, *Sarracenia alata* was more vigorous, with both larger leaves and rhizomes; while in the absence of fire *Sarracenia alata* tends to decrease in abundance. The addition of 6-12-12 fertilizer

(1 lb/100 sq. ft.) and ammonium nitrate (2 lb/100 sq. ft.), divided into two applications each, caused a decrease in *Sarracenia alata*. The bogs are not deficient in N-P-K as some have suggested; however, the amount of N-P-K decreased during the growing season. The nutrient levels in pounds per acre were: N, April 90, September 18; P, April 160, September 140; K, April 150, September 100. Plant succession on the bogs was toward a "sedge-woody species" dominated community. Fire, however, retards this succession, and we believe that the pitcher plant community is a "fire type" vegetation. Clip-quadrat studies pointed out that fire increases plant productivity. The greatest number of species were found in the burned bog, while the unburned bog was dominated by sedges, with a reduction in the total number of species. Although plants are in flower from March to November, there are two major phenological peaks, one in June and one in August.

The unique floral beauty and composition of the bogs make them of scientific and aesthetic importance. These ecosystems, however, are in danger of being destroyed by man's activities; such as, the expansion of suburban and industrial complexes northward from the coast, and the draining of the bogs and the planting of pine by public and private interests.

A phylogenetic list of the plant species is presented below. The phylogenetic arrangement and nomenclature generally follows that of Radford, *et al.* (1964), although Small (1933) and Hitchcock and Chase (1950) were also used in identification. Species not considered characteristic of bogs were also collected because they were present within the bogs due to slight alteration of the ecosystem by either man, ant hills, crayfish, or slight elevations or depressions. They are indicated by an asterisk (*) in the phylogenetic listing.

We would like to thank several individuals for their help with the project, including: Drs. Ben Channel, Robert Kral, and Sidney McDaniel, and Mr. F. H. Sargent. The

project was partially supported with the aid of a N.S.F. Grant (GB-4635) to the Mississippi Flora Project.

PHYLOGENETIC LIST OF THE TAXA:

LYCOPODIACEAE — *Lycopodium alopecuroides* L., *L. adpressum* (Chapm.) Lloyd & Underw., *L. carolinianum* L., *L. prostratum* Harper.

OSMUNDACEAE — *Osmunda cinnamomea* L., *O. regalis* var. *spectabilis* (Willd.) Gray.

PTERIDACEAE — *Pteridium aquilinum* (L.) Kuhn.

BLECHNACEAE — *Anchistea virginica* (L.) Presl., *Lorinseria areolata* (L.) Presl.

PINACEAE — *Pinus elliottii* Engelm., *P. palustris* Mill., *P. taeda* L.

TAXODIACEAE — *Taxodium ascendens* Brongn.

POACEAE — *Andropogon glomeratus* (Walt.) BSP., *Anthaenantia villosa* (Michx.) Beauv., *Aristida affinis* (Schult.) Kunth., *A. purpurascens* Poir., *A. stricta* Michx., *Arundinaria gigantea* (Walt.) Muhl., *Ctenium aromaticum* (Walt.) Wood., *Eragrostis spectabilis* (Pursh) Steud., *Manisuris cylindrica* (Michx.) Kuntz., *Muhlenbergia expansa* (DC.) Trin., *Panicum aciculare* Desv. ex Poir., *P. commutatum* Schult., *P. lanuginosum* Ell., *P. leucothrix* Nash., *P. longiligulatum* Nash., *P. repens* L., *P. sphaerocarpon* Ell., *P. verrucosum* Muhl., *P. virgatum* L., *P. wrightianum* Schribn., *Paspalum difforme* LeConte., *P. floridanum* Michx., **P. notatum* Flugge., *P. urvillei* Steud., *Sporobolus junceus* (Michx.) Kunth., *Tridens ambiguus* (Ell.) *Schult.*, *T. strictus* (Nutt.) Nash.

CYPERACEAE — *Carex glaucescens* Ell., *C. lurida* Wahlenb., *C. stylo-flexa* Buckl., *Dichromena colorata* (L.) Hitchc., *D. latifolia* Baldw., *Eleocharis tuberculosa* (Michx.) R. & S., *Rhynchospora caduca* Ell., *R. cephalantha* Gray., *R. chalarocephala* Fern. & Gale., *R. chapmanii* M. A. Curtis., *R. corniculata* (Lam.) Gray., *R. filifolia* Gray., *R. glomerata* (L.) Vahl., *R. gracilenta* Gray., *R. harveyi* W. Booth., *R. inexpansa* (Michx.) Vahl., *R. macra* (Clarke) Small., *R. microcephala* Britt. ex. Small., *R. oligantha* Gray., *R. plumosa* Ell., *R. rariflora* (Michx.) Ell., *R. tracyi* Britt., *Scirpus americanus* Pers., *Scleria baldwinii* (Torr.) Steud., *S. georgiana Core.*, *S. oligantha* Michx., *S. reticularis* Michx.

XYRIDACEAE — *Xyris ambigua* Beyr., *X. baldwiniana* R. S., *X. caroliniana* Walt., *X. difformis* Chapm., *X. fimbriata* Ell., *X. flexuosa* Muhl. ex Ell., *X. iridifolia* Chapm.

ERIOCAULACEAE — *Eriocaulon compressum* Lam., *E. decangulare* L., *E. lineare* Small., *Lachnocaulon anceps* (Walt.) Morong., *L. minus* (Chapm.) Small.

BROMELIACEAE — **Tillandsia usneoides* L.

JUNCACEAE — *Juncus biflorus* Ell., *J. brachycarps Engelm.*, *J. canadensis* J. Gay ex La Harpe., *J. effusus* L., *J. elliottii* Chapm., *J. marginatus* Rostk., *J. scirpoides* Lam., *J. validus* Cov.

LILIACEAE — *Aletris aurea* Walt., *A. farinosa* L., *A. lutea* Small., *Lilium catesbaei* Walt., *Melanthium virginicum* L., *Smilax laurifolia* L., *S. rotundifolia* L., *S. smallii* Morong., *Tofieldia racemosa* (Walt.) BSP., *Zigadenus densus* (Desr.) Fern., *Z. glaberrimus* Michx.

AMARYLLIDACEAE — *Hypoxis micrantha* Pollard.

HAEMODORACEAE — *Lachnanthes caroliniana* (Lam.) Dandy., *Lophiola americana* (Pursh.) Wood.

IRIDACEAE — *Sisyrinchium albidum* Raf.

ORCHIDACEAE — *Calopogon pallidus* Chapm., *C. pulchellus* (Salisb.) R. Br., *Cleistes divaricata* (L). Ames., *Habenaria blephariglottis* (Willd.) Hook., *H. ciliaris* (L.) R. Br., *H. cristata* (Michx.) R. Br., *H. nivea* (Nutt.) Spreng., *Pogonia ophioglossoides* (L.) Ker-Gawl., *Spiranthes praecox* (Walt.) S. Wats., *S. vernalis* Engelm. & Gray.

MYRICACEAE — *Myrica cerifera* L., *M. inodora* Bart., *M. pensylvanica* Loisel.

PHYTOLACCACEAE — **Phytolacca americana* L.

MAGNOLIACEAE — *Magnolia virginiana* L.

LAURACEAE — *Persea borbonia* (L.) Spreng.

SARRACENIACEAE — *Sarracenia alata* Wood & Wood., *S. psittacina* Michx.

DROSERACEAE — *Drosera brevifolia* Pursh., *D. capillaris* Poir., *D. filiformis* Raf., *D. intermedia* Hayne.

SAXIFRAGACEAE — *Itea virginica* L.

HAMAMELIDACEAE — *Hamamelis virginiana* L., *Liquidambar styraciflua* L.

ROSACEAE — **Rubus trivialis* Michx., *Sorbus arbutifolia* (L.) Heynh.

FABACEAE — **Clitoria mariana* L., **Lespedeza capitata* Michx., **Petalostemum pinnatum* (Walt. ex J. F. Gmel.) Blake.

LINACEAE — *Linum striatum* Walt., *L. virginianum* L.

POLYGALACEAE — *Polygala cruciata* L., *P. cymosa* Walt., *P. incarnata* L., *P. lutea* L., *P. mariana* Mill.

EUPHORBIACEAE — **Croton capitatus* Michx., **Euphorbia chamaesyce* L., **E. corollata* L., **E. maculata* L.

ANACARDIACEAE — *Rhus vernix* L.

CYRILLACEAE — *Cliftonia monophylla* (Lam.) Sarg., *Cyrilla racemiflora* L.

AQUIFOLIACEAE — *Ilex coriacea* (Pursh) Chapm., *I. glabra* (L.) Gray., *I. vomitoria* Ait.

ACERACEAE — *Acer rubrum* L.

RHAMNACEAE — *Ceanothus americanus* L.

VITACEAE — **Vitis rotundifolia* Michx.

MALVACEAE — *Hibiscus aculeatus* Walt.
HYPERICACEAE — *Hypericum cistifolium* Lam., *H. denticulatum* H.B.K., *H. fasciculatum* Lam., *H. stans* (Michx.) Adams & Robson.
VIOLACEAE — *Viola lanceolata* L., *V. primulifolia* L.
LYTHRACEAE — *Cuphea carthagensis* (Jacq.) Macbr.
MELASTOMATACEAE — *Rhexia alifanus* Walt., *R. cubensis* Griseb. *R. lutea* Walt., *R. mariana* L., *R. Nashii* Small., *R. virginica* L.
ONAGRACEAE — *Ludwigia hirtella* Raf., *L. pilosa* Walt., **Oenothera fruticosa* L.
HALORAGACEAE — *Proserpinaca pectinata* Lam.
APIACEAE — *Centella asiatica* (L.) Urban., *Eryngium integrifolium* Walt., *E. yuccifolium* Michx. var. *synchaetum* Gray., *Hydrocotyle umbellata* L., *Oxypolis filiformis* (Walt.) Britt.
NYSSACEAE — *Nyssa sylvatica* Marsh., *N. sylvatica* Marsh. var. *biflora* (Walt.) Sarg.
CLETHRACEAE — *Clethra alnifolia* L.
ERICACEAE — *Gaylussacia dumosa* (Andr.) T. & G., *Lyonia ligustrina* (L.) DC.
SYMPLOCACEAE — *Symplocos tintoria* (L.) L'Her.
STYRACACEAE — *Styrax americana* Lam., *S. grandifolia* Ait.
LOGANIACEAE — *Cynoctonum sessilifolium* J. F. Gmel., *Gelsemium sempervirens* (L.) Ait. f., **Polypremum procumbens* L.
GENTIANACEAE — *Sabatia campanulata* (L.) Torr., *S. dodecandra* (L.) BSP., *S. macrophylla* Hook.
ASCLEPIADACEAE — *Asclepias cinerea* Walt., *A. lanceolata* Walt., *A. longifolia* Michx., *A. michauxii* Dcne.
CONVOLVULACEAE — *Cuscuta gronovii* Willd.
POLEMONIACEAE — *Phlox carolina* L., *P. pilosa* L.
VERBENACEAE — *Lippia nodiflora* (L.) Michx.
LAMIACEAE — *Hyptis alata* (Raf.) Shinners., *Lycopus rubellus* Moench., *Scutellaria integrifolia* L., *Trichostema dichotomum* L.
SCROPHULARIACEAE — *Agalinis aphylla* (Nutt.) Raf., *A. purpurea* (L.) Pennell., *Buchnera floridana* Gandoger.
LENTIBULARIACEAE — *Pinguicula caerulea* Walt., *P. lutea* Walt., *Utricularia cornuta* Michx., *U. fibrosa* Walt., *U. juncea* Vahl., *U. subulata* L.
ACANTHACEAE — *Ruellia noctiflora* (Nees) Gray.
RUBIACEAE — *Cephalanthus occidentalis* L., **Diodia teres* Walt., *D. virginiana* L.
CAPRIFOLIACEAE — **Lonicera sempervirens* L., *Viburnum nudum* L.
CAMPANULACEAE — *Lobelia floridana* Chapm., *L. glandulosa* Walt., *L. puberula* Michx.
ASTERACEAE — *Aster dumosus* L., *A. lateriflorus* (L.) Britt., *A. linariifolius* L., *A. paludosus* Ait., *A. pilosus* Willd., *A. reticulatus* Pursh., *A. umbellatus* Mill., *Balduina uniflora* Nutt., *Bidens frondosa* L., *Boltonia asteroides* (L.) L'Her., *B. diffusa* Ell.,

Cacalia lanceolata Nutt., *Carduus lanceolatus* L., *C. lecontei* (T. & G.) Pollard., *C. spinosissimus* Walt., *Carphephorus pseudoliatris* Cass., *Chaptalia tomentosa* Vent., *Chondrophora nudata* (Michx.) Britt., *Coreopsis angustifolia* Ait., **C. lanceolata* L., *C. major* Walt., *C. pubescens* Ell., *Elephantopus elatus* Bertol., **Erechtites hieracifolia* (L.) Raf., **Erigeron canadensis* L., **E. philadelphicus* L., **E. quercifolius* Lam., **E. strigosus* Muhl. ex Willd., *E. vernus* (L.) T. & G., *Eupatorium album* L., **E. capillifolium* (Lam.) Small., *E. coelestinum* L., *E. hyssopifolium* L., *E. leucolepis* (DC.) T. & G., *E. rotundifolium* L., **Helenium amarum* (Raf.) H. Rock., *H. vernale* Walt., *Helianthus angustifolius* L., **H. divaricatus* L., *H. heterophyllus* Nutt., *H. radula* (Pursh) T. & G., *Heterotheca graminifolia* (Michx.) Shinners., *H. mariana* (L.) Shinners., *H. nervosa* (Willd.) Shinners., *Liatris aspera* Michx., *L. elegans* (Walt.) Michx., *L. gracilis* Pursh., *L. spicata* (L.) Willd. var. *resinosa* (Nutt.) Gaiser., *Pluchea rosea* Godfrey., *Rudbeckia hirta* L., *Solidago odora* Ait., *S. petiolata* Mill., *Stokesia laevis* (Hill) Greene., *Trilisa odoratissima* (J. F. Gmel.) Cass., *Vernonia altissima* Nutt.

LITERATURE CITED

ELEUTERIUS, L. N. 1968. Floristics and ecology of coastal bogs in Mississippi. M.S. Thesis. Univ. of Southern Mississippi, Hattiesburg.

GARREN, K. H. 1943. Effects of fire on vegetation of southeastern United States. Bot. Rev. **9**: 617-654.

HARPER, R. M. 1906. A phytogeographical sketch of the Altamaha Grit Region of the Coastal Plain of Georgia. Ann. N.Y. Acad. **7**: 1-415.

HITCHCOCK, A. S. and A. CHASE. 1950. Manual of the grasses of the United States. USDA Misc. Pub. 200. 1050 p.

PLUMMER, G. L. 1963. Soils of pitcher plant habitats in the Georgia Coastal Plain. Ecology. **44**: 727-734.

———————. 1966. Foliar absorption in carnivorous plants. Carolina Tips **29**: 25-26; 29-30.

PULLEN, T. M., JR. *and* G. L. PLUMMER. 1964. Floristic changes within pitcher plant habitats in Georgia. Rhodora **66**: 375-381.

RADFORD, A. E., H. E. AHLES, and C. R. BELL. 1964. Guide to the vascular flora of the Carolinas. The Book Exchange, Univ. of North Carolina, Chapel Hill. 375 p.

SMALL, J. K. 1933. Manual of the Southeastern Flora. (Reprint) The University of North Carolina Press, Chapel Hill. 1552 p.

WELLS, B. W. 1928. A southern upland grass-sedge bog: An ecological study. N. C. Agr. Exp. Sta. Tech. Bull. 32.

DEPARTMENT OF BIOLOGY,
UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG.
DEPARTMENT OF BOTANY, UNIVERSITY OF GEORGIA, ATHENS